3-D Data View — ISO 10303

AFEDG/JEDMICS Meeting

24 Mar 2004

Concurrent Technologies Corp.
4930 Ritter Rd
Mechanicsburg, PA 17055
fax: 610 449-0853

Naval Surface Warfare Center CD
Code 264 (Building 192, Room 128
9500 MacArthur Blvd
Bethesda, MD   20817-5700
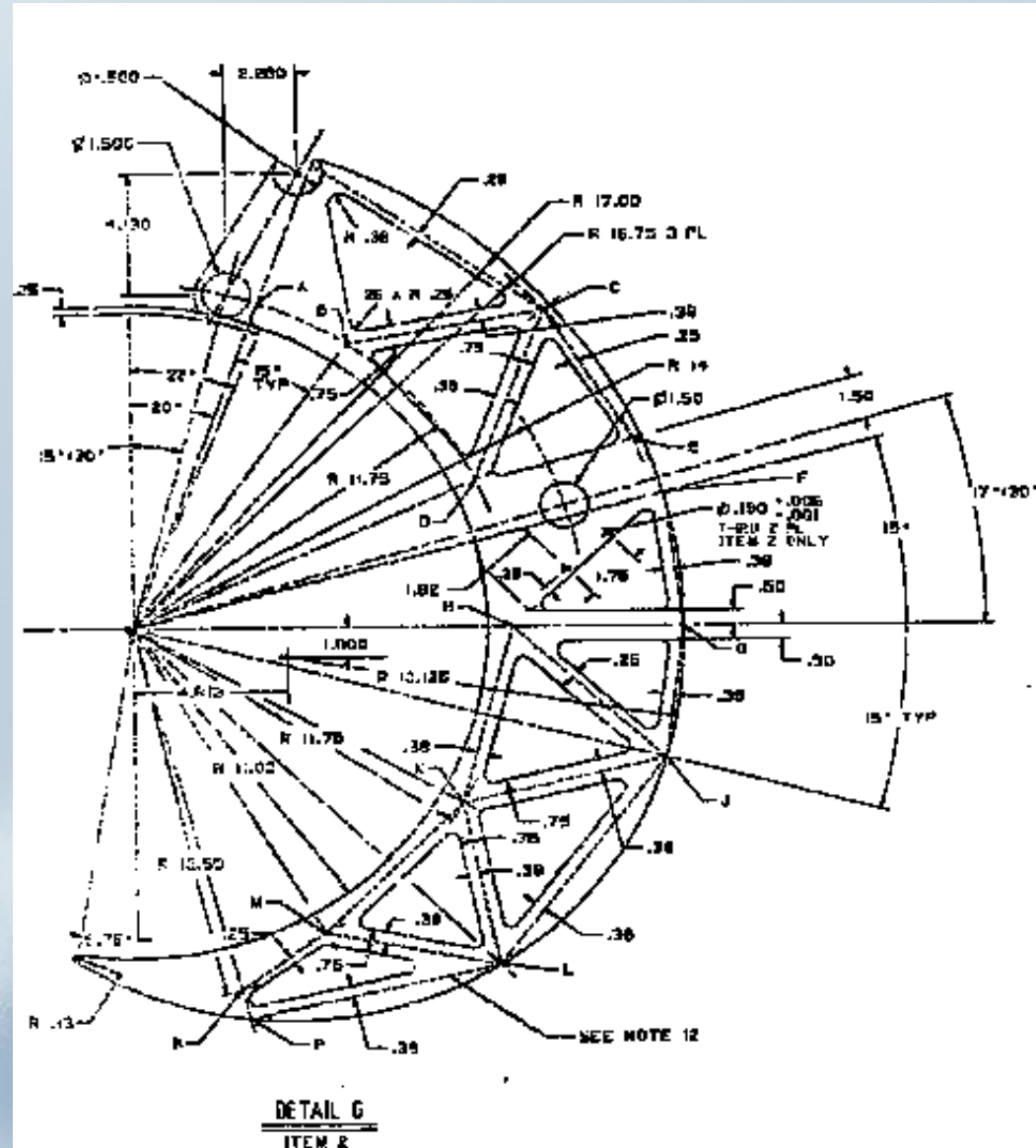**fax: 301 227-5753**

Objectives

- **Inform weapons system OEMs and software vendors of DoD's 3-D product model data and tool needs**

- **Encourage private and public infrastructure to create, manage, and use 3-D product model data**

Topics

- **Why 3-D?**
- **Why product model data?**
- **Why a neutral standard?**
- **What are the issues?**
- **How do we move forward?**

Why Product Model Data?

Simple 2-D torpedo retrieval claw from Naval Underwater Warfare Center, Keyport

Would you rather cut metal:

- using the paper drawing or

- by tracing a tool path around the CAD model on a CAM system?

Which one is more likely to be correct? The test showed
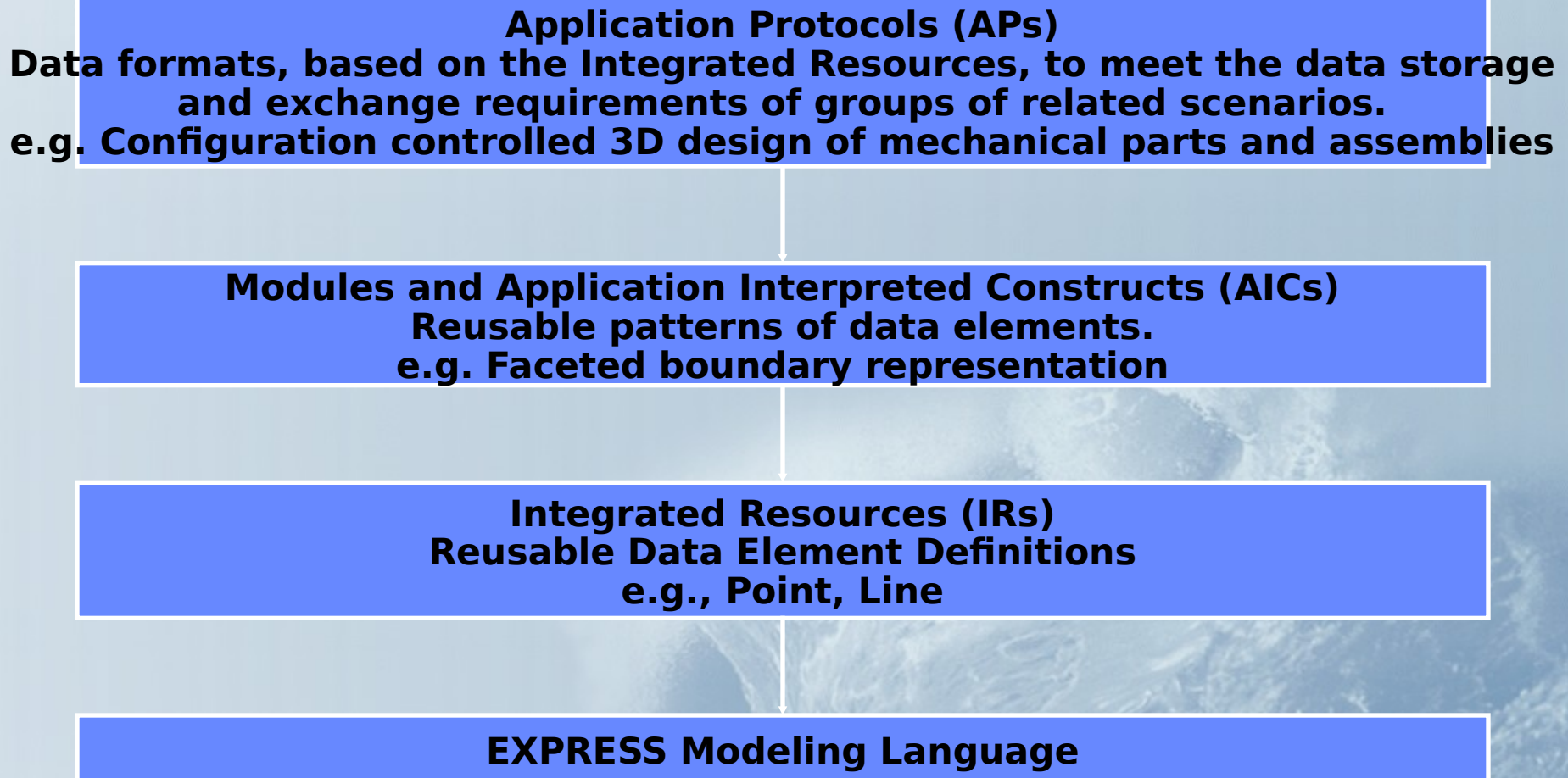

DETAIL G
ITEM 2

Industry Has Moved to 3-D Product Model Data

Industry requires a neutral international standard for 3-D product model data exchange to support global commerce and integrate supply chain
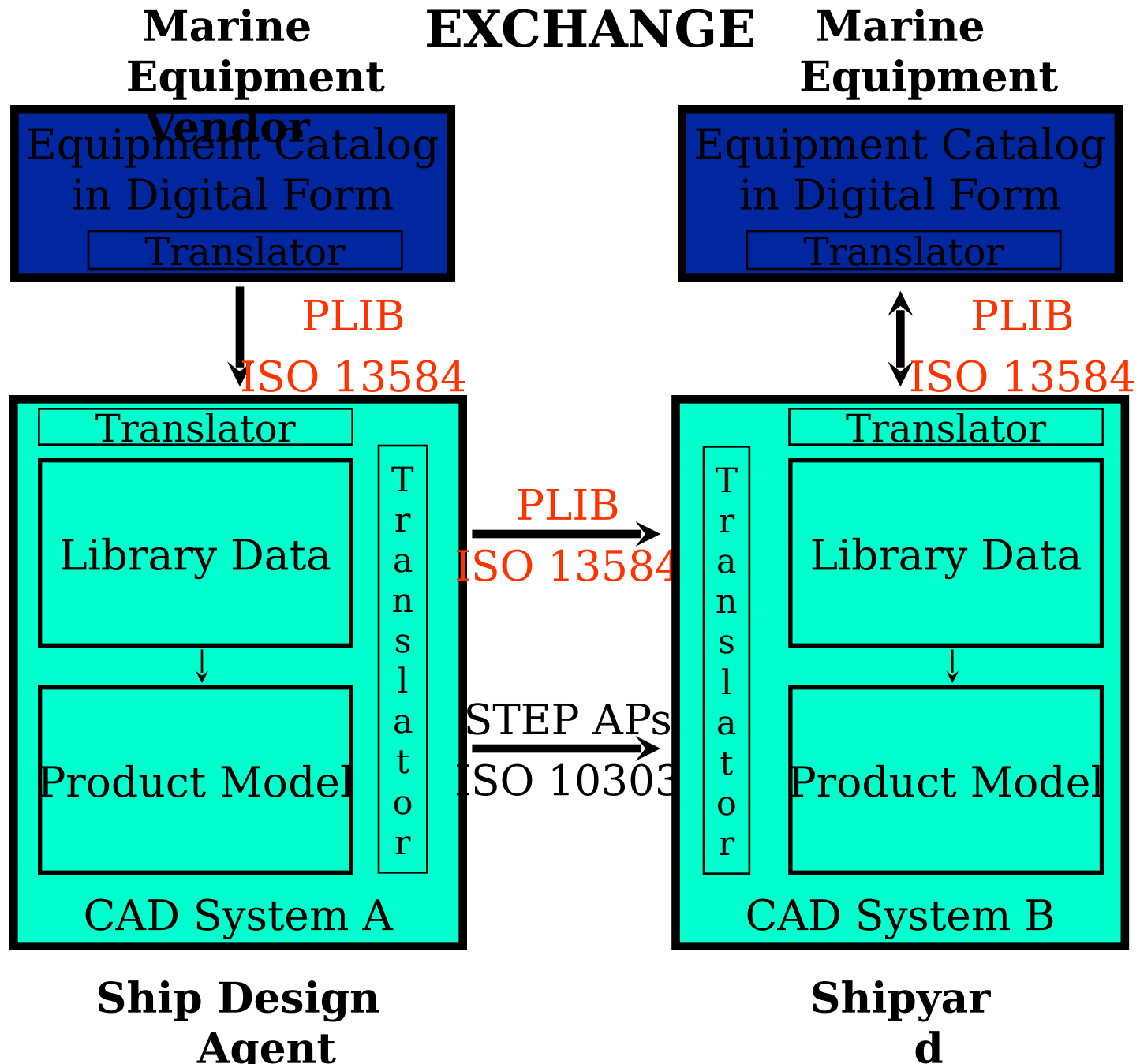
Neutral Standards for Product Model Data

- **ISO 10303 (STEP)**
  - **Representation of design and life cycle data of individual products (from piece parts up to entire ships)**
  - **Initial release published in 1994**
  - **Geometry translators for most major CAD systems**
- **ISO 13584 (PLIB)**
  - **Electronic dictionaries of class (standard item name) and property definitions**
  - **Electronic catalogs and parts libraries**
  - **Initial release 1998**
- **The two standards are integrated at several levels**

STEP Architecture

Application Protocols (APs)
Data formats, based on the Integrated Resources, to meet the data storage and exchange requirements of groups of related scenarios.
e.g. Configuration controlled 3D design of mechanical parts and assemblies

Modules and Application Interpreted Constructs (AICs)
Reusable patterns of data elements.
e.g. Faceted boundary representation

Integrated Resources (IRs)
Reusable Data Element Definitions
e.g., Point, Line

EXPRESS Modeling Language

SHIP PRODUCT MODEL CREATION AND EXCHANGE

Marine Equipment Vendor

Marine Equipment

Equipment Catalog in Digital Form

Translator

Equipment Catalog in Digital Form

Translator

PLIB
ISO 13584

PLIB
ISO 13584

Translator

Library Data

Product Model

Translator

PLIB
ISO 13584

STEP APs
ISO 10303

Translator

Library Data

Product Model

Translator

CAD System A

CAD System B

Ship Design Agent

Shipyard

Industry Accomplishments

AP201:1994 Explicit draughting

AP202:1996 Associative draughting

AP203:1994 Configuration controlled 3D designs of mechanical parts and assemblies

AP204:2002 Mechanical design using boundary representation

AP207:1999 Sheet metal die planning and design

AP209:2001 Composite and metallic structural analysis and related design

AP210:2001 Electronic assembly, interconnect and packaging design

AP212:2001 Electrotechnical design and installation

AP214:2001 Core data for automotive mechanical design processes

AP216:2003 Ship moulded forms

AP224:2001 Mechanical product definition for process planning using machining features
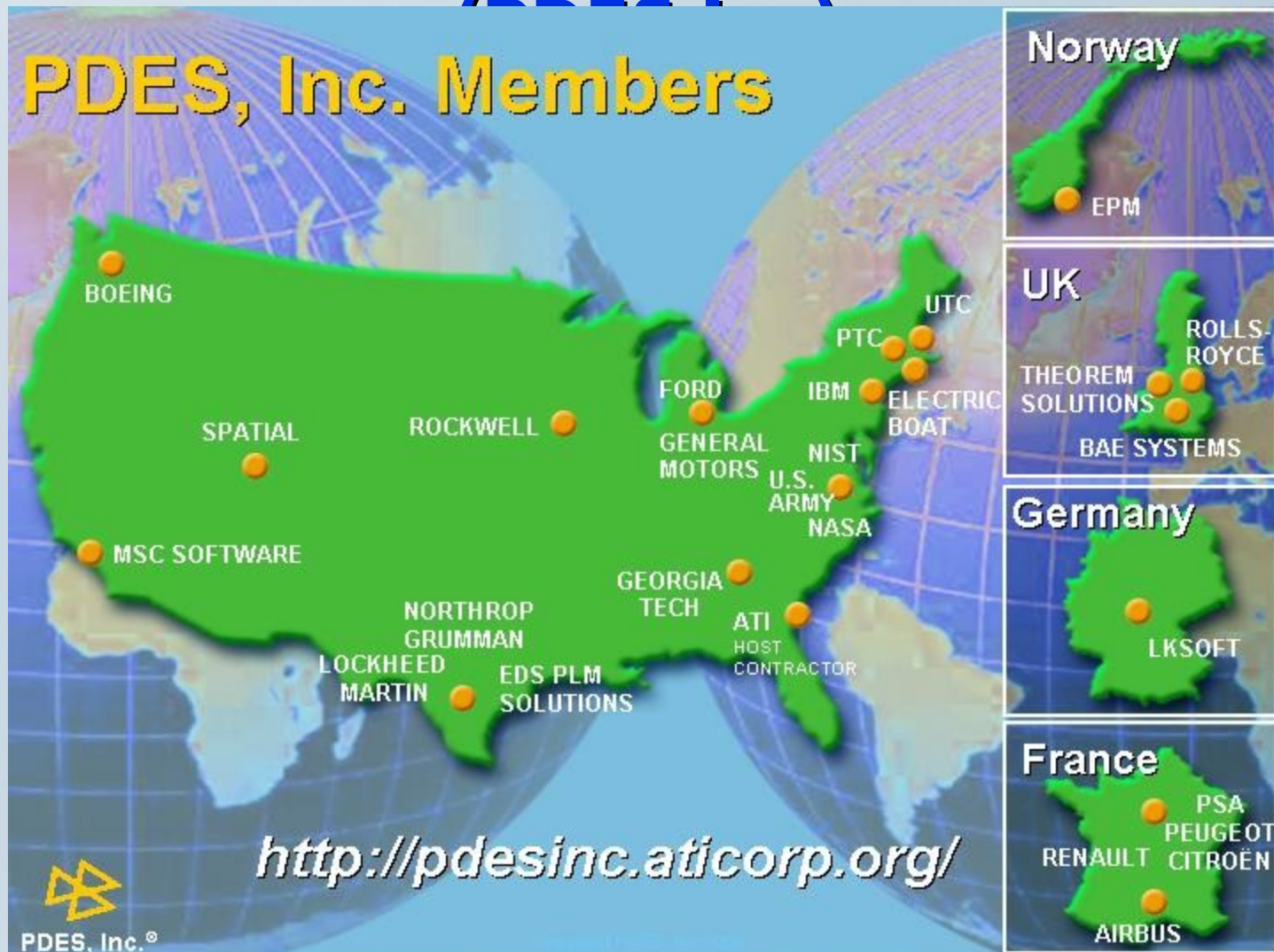
AP225:1999 Building elements using explicit shape representation

AP227:2001 Plant spatial configuration

AP232:2002 Technical data packaging core information and exchange

Companies Advancing US Development Product Data Exchange using STEP (PDES, Inc.)

DoD is Moving to 3-D too! Technical Data Guidance Referencing ISO 10303

DoD

- **MIL-STD-1840C, Automated Interchange of Technical Information, 26 Jun 1997**

- **DoD Joint Technical Architecture 6.0, 3 Oct 2003 (http://jta.disa.mil/)**

- **DLA ISO 10303 STEP Application Handbook 2.0, 21 Dec 2001**

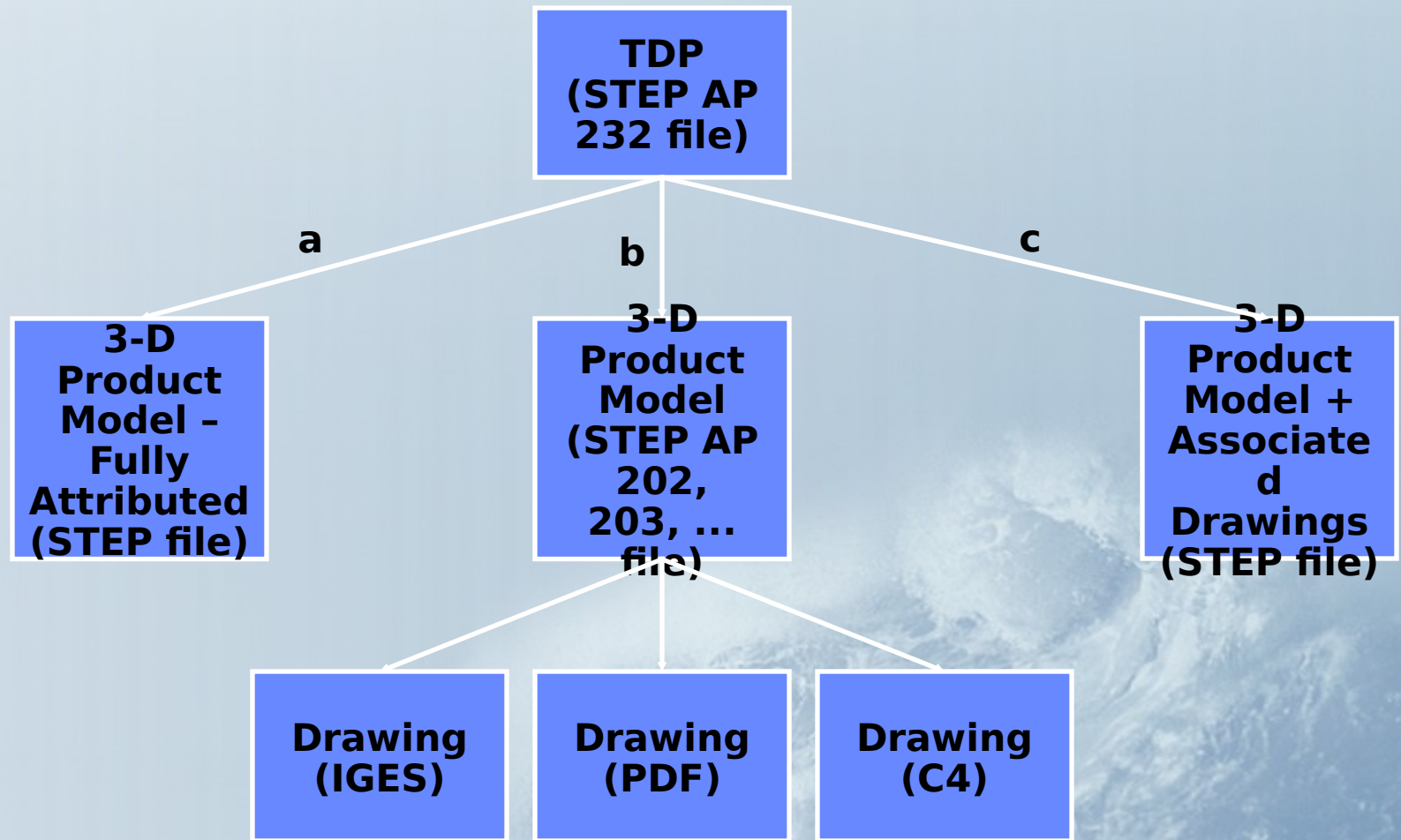- **Joint Aeronautical Commanders Group, Strategy for Product Data Throughout the Life Cycle, 8 May 2002 (http://pdesinc.aticorp.org/)**

DON

- **DON Policy on Digital Logistics Technical Data, 2 Nov 1999**

- **DON CIO Information Technology Standards Guidance, 5 Apr 1999**

Issues

- **What are DoD's requirements with respect to using 3-D product model data?**
- **Which STEP APs meet those requirements for acquisition and support?**
- **What software tools are available to enable non-engineers to review the data for acquisition of systems and spares?**
- **What is industry's capabilities to deliver and accept the data?**

Possible File Structures

```
                    ┌─────────────┐
                    │    TDP      │
                    │  (STEP AP   │
                    │  232 file)  │
                    └─────────────┘
           a              b               c
┌──────────────┐  ┌──────────────┐  ┌──────────────┐
│  3-D         │  │  3-D         │  │  3-D         │
│  Product     │  │  Product     │  │  Product     │
│  Model –     │  │  Model       │  │  Model +     │
│  Fully       │  │  (STEP AP    │  │  Associate   │
│  Attributed  │  │  202,        │  │  d           │
│  (STEP file) │  │  203, …      │  │  Drawings    │
│              │  │  file)       │  │  (STEP file) │
└──────────────┘  └──────────────┘  └──────────────┘

       ┌──────────┐  ┌──────────┐  ┌──────────┐
       │ Drawing  │  │ Drawing  │  │ Drawing  │
       │ (IGES)   │  │ (PDF)    │  │ (C4)     │
       └──────────┘  └──────────┘  └──────────┘
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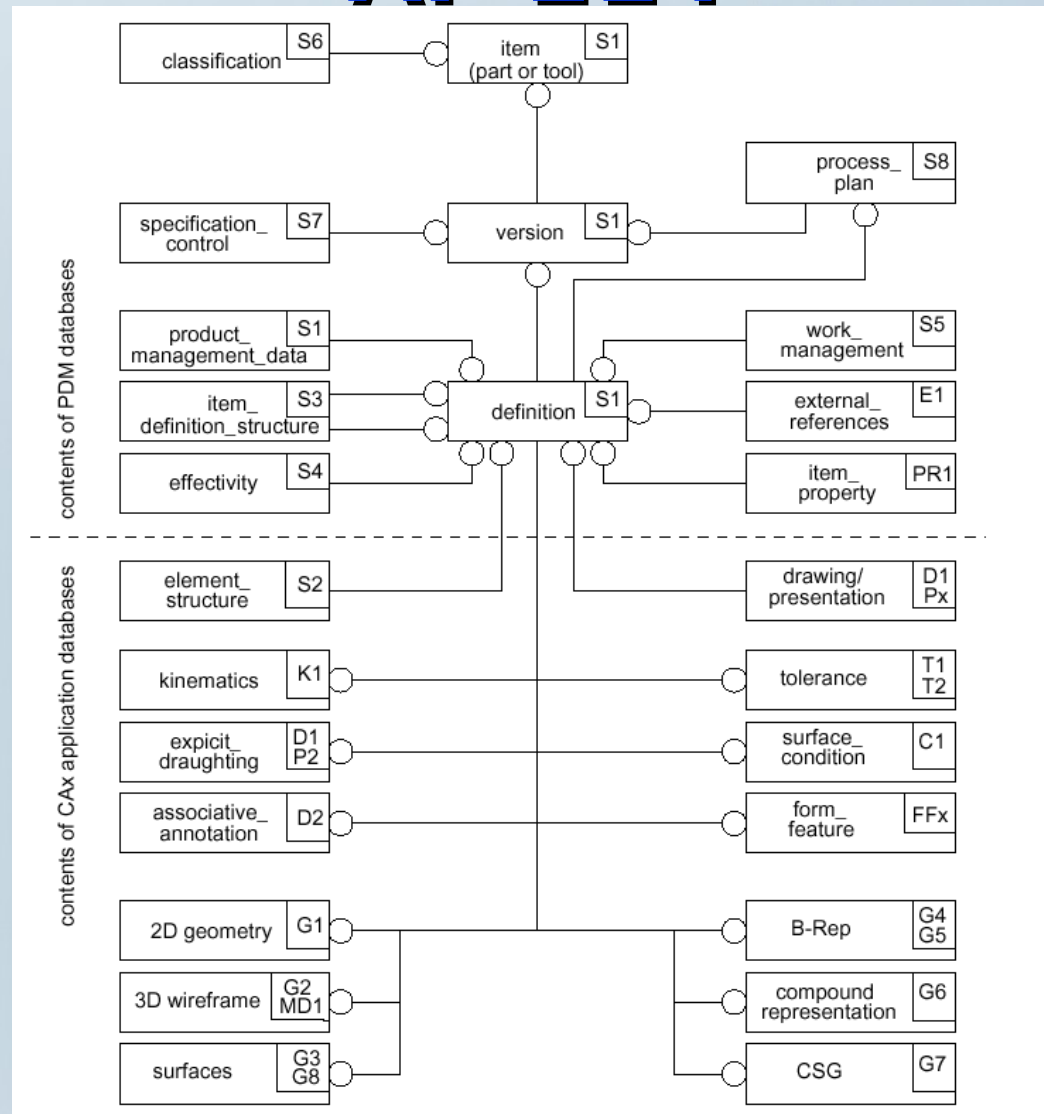
Potential Candidate APs

- **AP 202: Associative draughting**

- **AP 203: Configuration controlled 3D designs of mechanical parts and assemblies**

- **AP 214: Core data for automotive mechanical design processes**

- **AP 232: Technical data packaging core information and exchange**
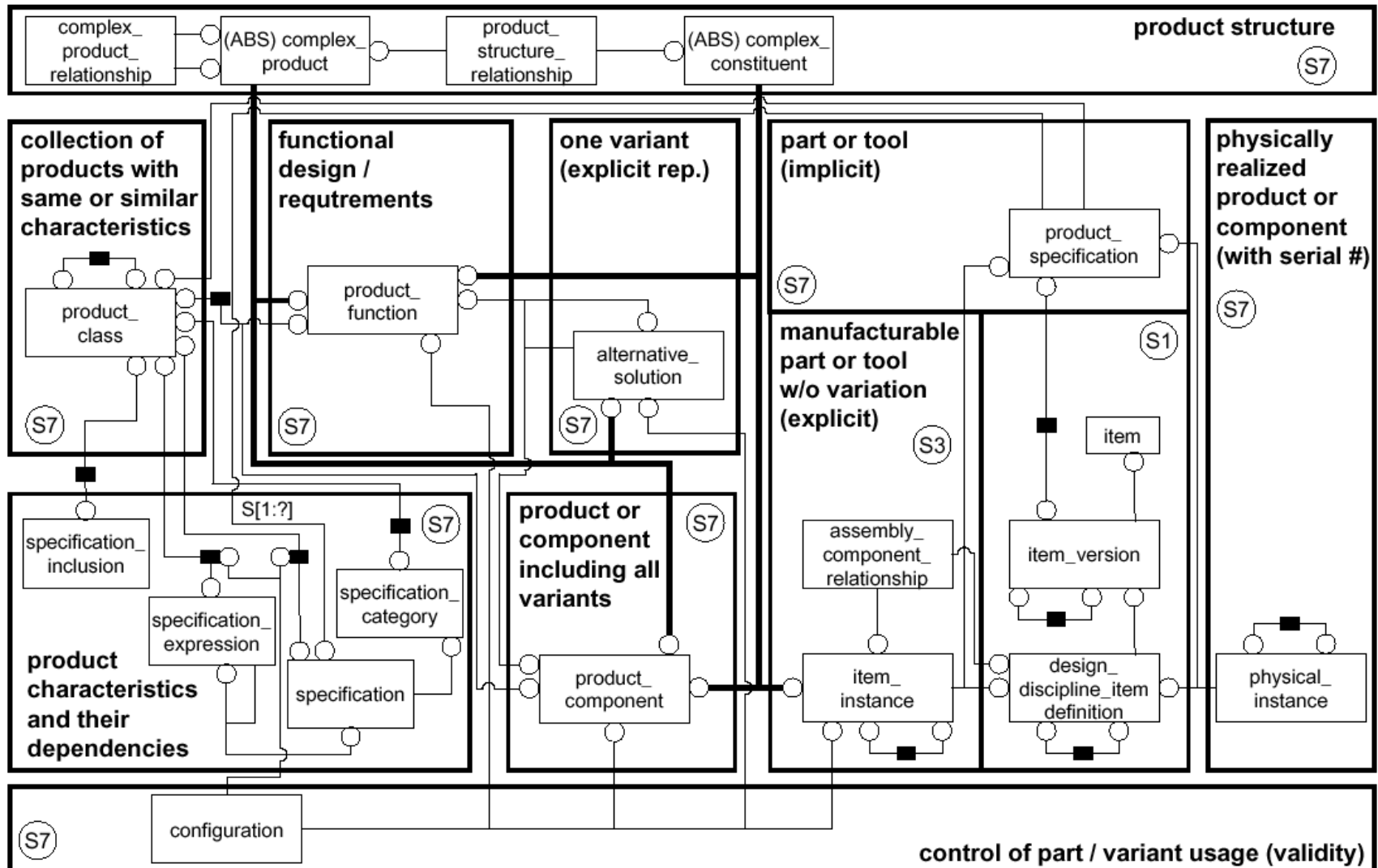
AP 214

AP 214

AP 232
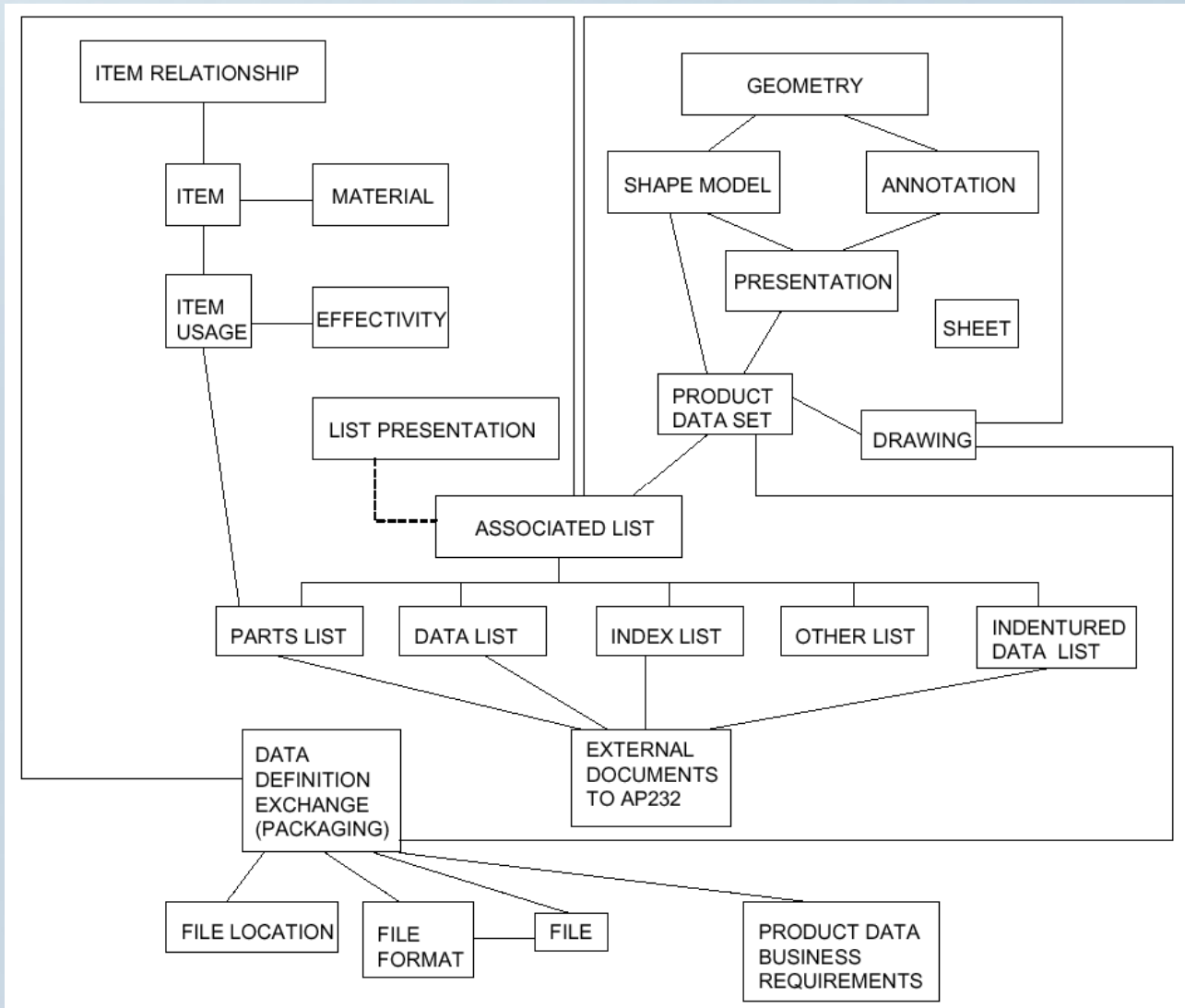
Additional Mechanical APs Under Development

- **AP 219: Dimensional inspection information exchange**

- **AP 233: Systems engineering**

- **AP 238: Computer numeric controllers**

- **AP 239: Product life cycle support**

- **AP 240: Process plans for machined products**

Survey

- **Identify DoD's 3-D product model data requirements for engineering and support**

- **Identify the STEP APs we should focus on specifying that meet the our needs**

- **Identify requirements for viewers**

Next Steps

- **Follow up survey with interviews of logistics and engineering users to determine product model data requirements**

- **Review software tools for viewing that data**

- **Create draft recommendations for changes to MIS-STD-52406**

- **Develop draft DIDs for ISO 10303**

- **Draft a RFI to publicize DoD's interest in ISO 10303 and solicit input from:**

  - **Weapons systems vendors and spare parts suppliers on their ability to deliver the 3-D data using the STEP mechanical APs that have been identified to address DoD needs.**

  - **CAD software vendors on the availability of tools to generate, edit or view 3-D data that would be stored in DoD data repositories, including JEDMICS, using the STEP mechanical APs**

For Additional Information

SC4ONLINE
http://www.tc184-sc4.com/

US Product Data Association (US PRO)
https://www.uspro.org/

PDES, Inc.
http://pdesinc.aticorp.org

American National Standards Institute (ANSI)
http://web.ansi.org/

International Organization for Standardization (ISO)
http://www.iso.ch/

International Electrotechnical Commission (IEC)
http://www.iec.ch/

Questions?